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ABSTRACT

To ascertain differences in cognitive ability, 50 monolingual and 50 bilingual Hispanic children enrolled in the same remedial education program for preschool four-year-old children in a large, urban school district in Arizona were administered the Cooperative Preschool Inventory in English. Subjects were matched on the basis of total scores to ensure that possible confouding variables of cultural differences, age, socioeconomic status, and total ability were controlled. Six motor response subscales comprised of 35 items were formulated: (1) knowledge of body parts, (2) the ability to follow simple or complex instructions, (3) following complex directions, (4) general knowledge, (5) quantitative knowledge, and (6) perceptual-motor coordination. A discriminant analysis followed by univariate F tests indicated monolinguals were superior to bilinguals in knowledge of body parts, whereas bilinguals were superior to monolinguals in the ability to follow complex directions and in perceptual-motor coordination. Although the latter conclusion provides supportive evidence for the beneficial effects of bilingualism, further study is needed. (Author/MM)

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A COMPARISON OF VERBAL AND MOTOR SKILLS OF MONOLINGUAL AND BILINGUAL HISPANIC CHILDREN - A DISCRIMINANT ANALYSIS

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Summary.-- A total of 50 monolingual and 50 bilingual preschool children were compared on the motor response subscales of the Cooperative Preschool Inventory (knowledge of body parts, the ability to follow simple instructions or complex directions, general knowledge, quantitative knowledge, and perceptual-motor coordination). The inventory was administered in English. Possible confounding variables of cultural differences, age, socioeconomic status, and total ability were controlled. A discriminant analysis followed by univariate F tests indicated monolinguals were superior to bilinguals in knowledge of body parts, whereas bilinguals were superior to monolinguals in the ability to follow complex directions and in perceptual-motor coordination.

Differences between monolinguals and bilinguals have long been of interest to researchers. It has been hypothesized that bilinguals have a greater cognitive burden because they speak two languages. It has been suggested that this leads to a cognitive deficit which has caused cognitive confusion. On the other hand, proponents of bilingualism and bilingual education assert that knowledge of two languages enhances cognitive structures, mental flexibility, and the ability to utilize complex cognitive schemata (Lopez, 1985; McLaughlin, 1978). Unfortunately much research comparing monolinguals and bilinguals is marred by the failure to control for such variables as different socioeconomic status, levels of ability, and culture. The purpose of the present study is to compare monolingual and bilingual children in six areas of skills which combine verbal, perceptual, and motor abilities. It is hypothesized that bilingual pupils will outperform monolingual pupils in variables involving complex verbal structures.

METHOD

A total of 50 monolingual-English Hispanic pupils (22 boys, 28 girls) and 50 Spanish-English bilingual Hispanic pupils (23 boys, 27 females) comprised the samples. Subjects were enrolled in the same remedial education program for preschool four-year-old children in a large, urban school district in Arizona. Eligibility for this

program which focused on raising reading, language arts, and mathematics ability included the following criteria: (a) the child must be the sibling of an older educationally disadvantaged child, (b) at least one parent lacks a high school education, (c) the child participates in a free lunch program, and (d) the child has limited English proficiency.

The Cooperative Preschool Inventory (Caldwell, 1970) is an individually administered school readiness inventory of verbal and motor skills. The present study focuses only on the motor response items which consist of English instructions and pupil responses which involve a variety of skills. The responses to these items actually involve the integration of verbal, perceptual and motor skills. The motor items are 35 items which could be grouped (Caldwell, 1974) into six subscales: (a) knowledge of body parts (3 items), (b) following simple instructions (3 items), (c) following complex directions (11 items), (d) general knowledge (7 items), (e) quantitative knowledge (7 items), and (f) perceptual-motor coordination (4 items).

Researchers have generally found supportive evidence of the reliability and validity of the scale. Caldwell (1970) reported an internal consistency reliability estimate to be .88. More recently Powers and Medina (in press) reported a reliability estimate of .92 for the scale and apparently adequate concurrent validity coefficients.

Subjects were administered the inventory in October 1982 or October 1983 by the pupils' regular classroom teacher. Monolinguals and bilinguals were Hispanic four-year-olds participating in a federally-funded free lunch program for low income families. Further, monolinguals and bilinguals were matched or their total scores on the inventory which was the sum of the verbal and motor response items (64 items) of the scale. Matched subjects in both groups did not differ by more than one score point on the total inventory. Thus, the possible confounding variables of cultural differences, age, socioeconomic status and overall achievement appeared to be adequately controlled because all students were Hispanic, approximately four-year-old, participating in the free lunch program, and matched on the total score of the inventory.

A discriminant analysis (Powers, in press) was performed using the six motor response subscales of the inventory as predictors of differences between monolingual and bilingual four-year-old Hispanic children. A stepwise procedure was employed in order to identify a subset of predictor variables which would form as optimal linear discriminant function. The variable selected at each step would be the variable with the smallest Wilks' lambda.

RESULTS AND DISCUSSION

To examine the degree to which the matching procedure produced comparable groups, the means and variances of the monolinguals ($\underline{M}$ = 29.72, $\underline{SD}$ = 11.73) and the bilinguals ($\underline{M}$ = 29.84, $\underline{SD}$ = 11.95)

were compared. Neither the total score means ($t_{98} = .05$, $p < .960$) nor the variances ($F_{49,49} = 1.04$, $p < .895$) were significantly different. In order to test an assumption of discriminant analysis, the covariance matrices of the two groups were compared with Box's M test. It was found that the covariance matrices were not significanlty different ($p < .264$).

The stepwise discriminant analysis procedure selected three variables to form the optimal linear discriminant function. The standardized discriminant weights were associated with the following subscales: (a) knowledge of body parts (-.68), (b) following complex directions (.41), and perceptual-motor coordination (.58). Table 1 presents comparisons of each predictor variable in the analysis.

Insert Table 1 about here

Contrary to the research hypothesis, monolinguals ($M = 1.56$) outperformed bilinguals ($M = 1.26$) in knowledge of body parts. However, in support of the research hypothesis, it was found that bilingual ($M = 5.54$) exceeded monolingual ($M = 4.60$) in the ability to follow complex directions. Further, bilinguals ($M = 2.50$) outperformed monolinguals ($M = 1.92$) in perceptual-motor coordination.

The analysis revealed that the three variables could form a significant discriminant function ($p < .01$), and the magnitudes of the three discriminant weights suggested that each variable contributed similarly to the discrimination of the two groups.

These results suggest that when monolinguals and bilinguals are compared, either group may exceed the other in some selected skill. Yet the finding that bilinguals exceeded monolinguals in the ability to follow complex directions may be particularly encouraging to proponents of bilingualism and bilingual education. Following complex directions in this study involved understanding a statement such as "Put the red car on the black box", then perceiving the objects, colors, and relations, and carrying out the task. These eleven complex tasks on which the bilinguals exceeded contrast sharply with the simple motor-related tasks of the inventory such as "Show your hand". The perceptual-motor scale items consisted of four instructions for the students to draw a line, circle, square, and triangle.

Far from supporting a deficit hypothesis of bilingualism, these results provide some supportive evidence of beneficial effects of bilingualism. However, further evidence must be accumulated before unambiguous claims of a beneficial effect of bilingualism can be made.

REFERENCES

Caldwell, B.M. Cooperative Preschool Inventory: revised edition. Menlo Park: Addison - Wesley, 1970.

Caldwell, B.M. Cooperative Preschool Inventory: Spanish edition. Menlo Park: Addison - Wesley, 1974

Lopez, R.L., Jr. Survival of bilingual education via the cognitive era. Paper to be presented at the annual meeting of the National Association for Bilingual Education in San Francisco, March 13-16, 1985.

McLaughlin, B. Second language acquisition in Childhood. Hillsdale, N.J.: Lawrence Erlbaum, 1978.

Powers, S. DISCRIM: A BASIC program to perform discriminant function analysis. Behavior Research Methods, Instruments & Computers, in press.

Powers, S., & Medina, Marcello, Jr. Reliability and validity of the Cooperative Preschool Inventory for English - and Spanish - speaking Hispanic children. Educational and Psychological Measurement, in press.

TABLE 1

Means, Standard Deviations. and Univariate F ratios for All Predictor Variables

Variables	Monolinguals		Bilinguals			
	M	SD	M	SD	D[a]	F[b]
Knowledge of Body Parts	1.56	.93	1.26	.66	.30	3.45*
Following Simple Directions	1.98	.77	1.98	.85	.00	.00
Following Complex Directions	4.60	2.84	5.54	2.54	.94	3.05*
General Knowledge	3.34	1.62	3.52	1.74	.18	.29
Quantitative Knowledge	2.88	1.55	2.86	1.82	.02	.00
Perceptual-Motor Coordination	1.92	1.14	2.50	1.00	.58	7.35*

[a] Bilinguals M - Monolinguals M

[b] df = 1, 98

* p < .10 ** p <.05 *** p <.01

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